

Claim 70, line 7, change "ads" to --and--;

line 7, change the third use of the word "an" to --a--.

REMARKS

In the last Office Action, the Examiner withdrew claims 59, (61), 66 and 76 from consideration as being drawn to a non-elected invention; rejected claims 60, 67 and 70 under 35 U.S.C. § 112, first paragraph, for lack of enablement; objected to claims 69 and 70 for typographical errors; and rejected claims 21-23, 26, 47, 48, 60-65, 67-75, 77 and 78 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,018,037 to Krounbi et al. ("Krounbi") in view of U.S. Patent No. 5,733,370 to Chen et al. ("Chen").

By this amendment, Applicants propose to correct the typographical errors in the claims.

Regarding the restriction requirement applied by the Examiner to claims 59, 66, and 76, Applicants respectfully traverse this restriction. Initially Applicants note that the Examiner included claim 61 on line 6 of paragraph 2 but did not include that claim on line 1 of paragraph 2 or on the Office Action Summary. Further, claim 61 stands rejection under Section 103. Applicants, therefore, assume that claim 61 is pending in this application.

Further, Applicants request clarification of the grounds for restricting the above noted claims. The Examiner's statement that "the claims submitted are *not* directed to Species VII" is an insufficient basis for requiring such a restriction. The Examiner must show not only that "a different invention" has been presented, but also that a substantial

burden would be placed on the Examiner. These claims depend from claims included by the Examiner in Group VII, and therefore, include all of the limitation of a Group VII claim. Applicants fail to perceive any burden placed on the Examiner or any grounds upon which the Examiner has shown that the cited claims should not be included as Group VII claims. It is the Examiner's burden to show that these claims are not included in the elected group and to show that a burden exists in reviewing those claims. Applicants, therefore, respectfully request that the withdrawal of claims 59, 66, and 76 from consideration be withdrawn.

Specifically regarding the recited elements of claims 59, 66, and 76, these claims simply further define the characteristics of the bi-crystal structure claimed in the claims from which claims 59, 66 and 76 depend. It is clear that a film having the characteristics so claimed are within the bounds defined by "bi-crystal" structure, but simply present a more narrow definition of the structure.

Regarding the Section 112 rejection of claims 60, 67, and 77 as lacking enablement, Applicant respectfully traverses this rejection. The ground presented by the Examiner is that "[t]he specification fails to enable a skilled artisan how to make and/or utilize an underlayer having a thickness approaching zero." Applicants assert that there is no basis in law for the Examiner's assertion of lack of enablement. Applicant did not state a range starting at zero, but rather recited a thickness less than a finite amount. The law as it currently stands does not place a burden on the Applicant to show enablement of every possible construction of the claim language, but rather reads in level of reasonableness in view of the ordinary skill in the art when interpreting claim language. By performing a brief search of the United States Patent and

Trademark Office database, Applicants found 259,048 uses of the claim language "less than" and 229,245 uses of the claim language "more than." Many if not all of these claims fail to be defined at either zero or infinity, however, the operative question is whether a person having ordinary skill in the art would be able to make and or use the claimed invention. A computer network having less than 100 computers clearly does not intend to encompass a computer network having zero computers but such would be included in the scope of the claim if defined as suggested by the Examiner. Applicants respectfully reiterate that the enablement requirement of Section 112 is limited to requiring that a person having ordinary skill in the art be able to make and or use the claimed invention. There is no lack of enablement of an underlayer having a thickness of 50nm or less, and therefore, Applicants respectfully request that the rejection of claims 60, 67, and 77 be withdrawn.

Regarding the objection to claims 69 and 70, Applicants have amended the claims to comply with the Examiner's instructions .

Regarding the rejection of claim 21 as being unpatentable over Krounbi in view of Chen, Applicants reiterate that the Examiner has simply combined unrelated elements from distinct devices without motivation to recreate Applicants' claimed invention. The Examiner, using hindsight in view of Applicant's disclosure has proposed a combination that is neither suggested by nor reasonably inferred from the cited references. In response to Applicants' arguments regarding the patentability of claim 21, the Examiner stated:

The fact that Chen discloses a medium does not preclude the utilization of a film in a different, yet related device. And as stated above, a skilled artisan would have been motivated to provide the layer of Chen in the

device of Krounbi et al is to suppress Barkhausen noise. Noise, as disclosed by Chen, is a concern in recording mediums and it is a concern in magnetic heads, as well. The fact that it takes the form of Barkhausen noise in a head does not lessen the need of noise reduction.

The argument presented by the Examiner simply has no scientific merit. Noise is not a single physical phenomenon having a single cause and effect, but rather has diverse causes in different situations. There are noisy tape recordings, noisy radio signals, noisy television signals . . . , however the mere fact of noise does not suggest to one having ordinary skill in the art to combine the above noted film in any of those devices to solve the "noise problem."

The Examiner fails to understand that medium noise is distinct and different from Barkhausen noise. Applicant has enclosed a conceptual drawing of the difference between the two noise types as Appendix A to this amendment.

The Barkhausen effect is described at phy-server.phy.queensu.ca/wwwhome/atherton/barkhausen.html as follows:

The Barkhausen effect consists of discontinuous changes in flux density during smoothly changing magnetic field. These are known as jumps and are caused by the sudden irreversible motion of magnetic domain walls as they break away from pinning sites.

As described above, and as illustrated in the attached figures, the Barkhausen noise is a phenomena that exhibits discontinuous responses to incident magnetic fields from a medium due to the presence of a multi-domain structure in the free layer formed of the soft magnetic layer. The discontinuous responses occur when the bias magnetic field is insufficient to form a single domain in the free layer. The suppression of Barkhausen noise is accomplished using a hard magnetic film having a strong magnetic field generation ability (high Mr). Inapposite to this requirement, non-fluctuated hard

magnetic field generation (low Mr) is important for reducing medium noise.

The noise caused by the Barkhausen effect, therefore, is the result of changes in the magnetic properties of a magnetic substance due to an *incident* magnetic field. These discontinuous jumps are specifically problematic in sensing devices, as the signal produced by the sensing device will be altered by the above cited discontinuous jumps as the incident magnetic field from the recording medium changes. Again, however, these jumps are caused by an incident magnetic field. In operation, the magnetic sensing device is used to sense an incident magnetic field, while a magnetic recording medium is used to induce that magnetic field in the sensing device. There is no teaching or suggestion that the solution to a problem in the field of magnetic recording media will or could have any beneficial result in the field of magnetic sensing.

Specifically with respect to Chen, there is no teaching or suggestion in Chen that Barkhausen noise is a problem in magnetic recording media. Instead, Chen discloses that "medium noise is a dominant factor restricting increased recording density of high density magnetic hard disk drives." There is no teaching or suggestion that medium noise has any correlation to the Barkhausen effect. At page 5, lines 3-4 of the Office Action, the Examiner states "Chen et al discloses column 3, lines 37-50 magnetic field applying films having hard magnetic films containing cobalt (Co) as a structural element being a bi-crystal structure." The section of the Chen specification cited clearly teaches a film, but fails to teach or suggest a magnetic field applying film as suggested by the Examiner. The Examiner has impermissibly expanded the scope of the term noise to encompass all noise causing effects in determining that Applicants' claimed invention is obvious over the prior art. Applicants find no basis in fact to suggest that a person

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having ordinary skill in the art upon finding that the film of Chen reduces medium noise would then be motivated to use that film in the distinct field of magnetoresistance effect elements.

Since Barkhausen noise is different from medium noise, different physical characteristics are required between the present invention and the magnetic storage medium as disclosed by Chen. As seen in the figures of Appendix A, the merit of using the bi-crystal structure in Chen is to decrease noise based on the fluctuation of the medium flux itself.

As is well known in the art of magnetic recording media, as recording density in a magnetic recording medium increases, Mr of the medium decreases. It is therefore necessary to use a hard magnetic material having high Hc and low Mr. In order to satisfy the required characteristics, it has been well known to use hard magnetic materials containing large amounts of added elements (such as the CoCr based alloy of Chen).

On the other hand, in the field of magnetic heads, it has been well known in the art that the bias films of the magnetic head should have high Hc and high S. The importance of high Mr, however, is completely new to the art. The improvement in the bias field due to the use of a film having high Mr properties was discovered and disclosed first by Applicants. These characteristics are different from those required by the bi-crystal film of the recording medium of Chen.

Prior to Applicants' invention, hard magnetic films allowing high Mr could not practically realize high Hc. Applicants found that the claimed bi-crystal structure could realize high Mr bias while maintaining high Hc and high S. Simply applying the

conventional magnetic layer from the magnetic recording medium of the cited reference would not obviate the problem of Barkhausen noise in a magnetic recording head.

In view of the forgoing comments, claim 21 and its dependent claims are patentable over the applied reference.

Regarding the Section 103 rejection of claim 22, the Examiner states "Krounbi et al also shows in figure 3 hard magnetic film 26 containing Co as a structural element and *is considered to have* Co(110) crystallographic orientation oriented perpendicular to the surface." Applicants request clarification of the grounds of rejection presented by the Examiner. There is no teaching or suggestion in Krounbi that the claimed orientation be used. Further, the use of such orientation is not inherent to nor necessitated by the disclosed structure of Krounbi. The Examiner seems to suggest that the disclosure of a film having Co thereby anticipates all such films. Such an assertion reaches far beyond the scope of obviousness under Section 103, and therefore, Applicants respectfully request that the rejection of claim 22 be withdrawn.

Regarding claim 23, 26, 47, 48, these claim are patentable, at least, in view of their dependence from independent claim 21.

Regarding claim 60, Applicants respectfully traverse the grounds for rejection presented by the Examiner. Claim 60 depends from claim 21 and requires an underlayer having a thickness of 50nm or less disposed between the substrate and the hard magnetic layer composed of an amorphous layer formed on the substrate and a crystal layer formed on the amorphous layer. The Examiner states at page 5 of the Office Action that "an amorphous underlayer [is] notoriously well known in the magnetic head art." Initially, Applicants traverse the Examiner's assertion of notoriety with

respect to a layer having the characteristics recited in claim 60. Applicants respectfully request that the Examiner provide citations disclosing an underlayer having the claimed characteristics.

Applicants further traverse the proposed combination presented by the Examiner. The salient question in presenting a rejection under Section 103 is not whether the element cited by the Examiner is known in the prior art, but rather, whether it would have been obvious to a person having ordinary skill in the art to use the prior art element in the apparatus of the cited reference. The Examiner cites as the motivation for the combination "to provide a magnetic read head able to read a high density on a magnetic recording medium." The Examiner has cited no reference to suggest that the use of an underlayer as claimed would improve the reading capacity of the read head. This assertion, therefore, is impermissible hindsight in view of Applicants' disclosure.

Regarding claim 61, this claim is patentable, at least, in view of its dependence from claim 21.

Regarding claim 62, Applicants respectfully traverse the rejection of this claim. The Examiner states at page 4 of the Office Action that the hard magnetic films are "considered to have a residual magnetization M_r of 650 emu/cc." The use of the word "considered" does not alter the fact that the cited prior art fails to teach or suggest the claimed element. It is impermissible to reject claims based on the Examiner's perceptions of what characteristics an element of the prior art could possess. There is no basis in law for such an extension of the bounds of obviousness to include all possible characteristics of a disclosed structure. Applicants, therefore, request that the

rejection of claim 62 be withdrawn.

Regarding claim 63, as with claim 62 above, there is no basis for rejecting a claim based on a characteristic that a prior art element could possibly possess. For essentially the same reason, therefore, claim 63 is patentable over the applied references.

Regarding claims 64, 65 and 67-69, these claims are patentable, at least, in view of their dependence from claim 62.

Regarding claim 70, the Examiner has cited no reference teaching an under-layer composed of an amorphous layer and a metal crystal layer formed on the amorphous layer, and a hard magnetic film formed on the metal crystal layer of the under-layer. The Examiner's assertions of both obviousness and notoriety are traversed by Applicants. Applicants reiterate that it is not the knowledge of the use of a prior art structure that is in question, but rather whether a person having ordinary skill in the art would have been motivated to combine a prior art structure into the structure of the cited prior art. There is no basis to support this contention, and therefore, claim 70 is patentable over the applied references.

Further, Applicants found that in order to realize the bi-crystal structure for use in a magnetic head, the use of a double layer structure composed of a crystal layer and an amorphous layer as an underlayer for the bias film enables the production of a bi-crystal structure having a thickness thinner than the medium. Such a structure is not taught or suggested in the cited references. For this additional reason, therefore, claim 70 is patentable over the applied references.

Regarding claim 71, this claim is patentable, at least in view of its dependence

from claim 70.

Regarding claim 72, this claim is patentable in view of its dependence from claim 70 and for essentially the same reasons expressed above with respect to claim 62.

Regarding claim 73, this claim is patentable, at least, in view of its dependence from claim 70.

Regarding claim 74, as discussed above, the Examiner has presented no valid motivation for using a hard magnetic film having a bi-crystal structure. The film of the magnetic recording media of Chen is simply inapplicable to the problems posed by a magnetoresistance effect device as claimed.

Regarding claim 75, this claim is patentable, at least, in view of its dependence from claim 70.

Regarding claim 77, the Examiner has cited no prior art reference as teaching an under-layer having a thickness of 50nm or less. Applicants, therefore, request that the rejection of claim 77 be withdrawn.

Regarding claim 78, this claim is patentable, at least, in view of its dependence from claim 70.

Applicant respectfully requests that this Amendment under 37 C.F.R. § 1.116 be entered by the Examiner, placing claims 21-23, 26, 47, 48, 60-65, 67-75, 77, and 78 in condition for allowance. Applicants submit that the proposed amendments of claims 69 and 70 do not raise new issues or necessitate the undertaking of any additional search of the art by the Examiner, since all of the elements and their relationships claimed were either earlier claimed or inherent in the claims as examined. Therefore, this Amendment should allow for immediate action by the Examiner.

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Furthermore, Applicants respectfully point out that the final action by the Examiner presented some new arguments as to the application of the art against Applicants' invention. It is respectfully submitted that the entering of the amendment would allow the Applicants to reply to the final rejections and place the application in condition for allowance.

Finally, Applicants submit that the entry of the amendment would place the application in better form for appeal, should the Examiner dispute the patentability of the pending claims.

In view of the foregoing remarks, Applicants submit that the claimed invention, as amended, is neither anticipated nor rendered obvious in view of the prior art references cited against this application. Applicants, therefore, request the entry of this Amendment, the Examiner's reconsideration and reexamination of the application, and the timely allowance of the pending claims.

Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

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